

JAPANESE

[JP,11-154585,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL  
FIELD PRIOR ART EFFECT OF THE INVENTION  
TECHNICAL PROBLEM MEANS EXAMPLE  
DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

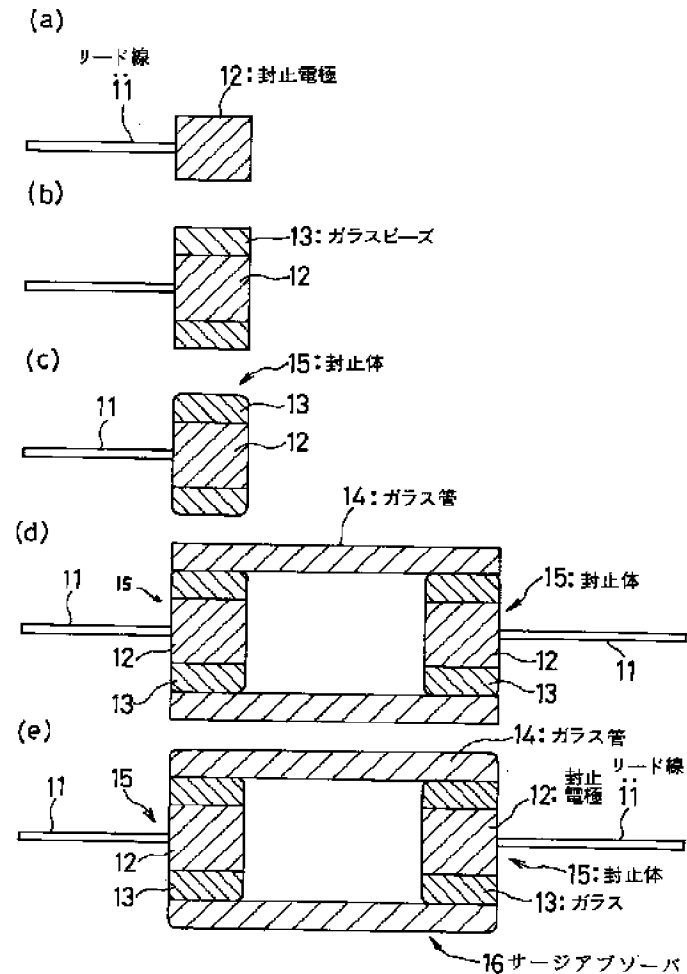
[Field of the Invention]This invention relates to the sealing method for manufacturing the surge suppressor by which gas was enclosed in the glass tube.

[0002]

[Description of the Prior Art]As a surge suppressor for absorbing the surge voltage impressed to electronic equipment, a surge absorbing element is inserted in a glass tube with filler gas, and there are some which inserted, heated and closed the sealing electrode made from JUMETTO at the end of this glass tube (hermetic seal). In this case, by making a sealing electrode attach a glass bead outside, what has a big path as a glass tube can be adopted now, and firing potential of a surge suppressor can be made high as a result.

[0003]When a sealing electrode is made to attach a glass bead outside and a surge suppressor is manufactured,

Drawing selection Representative draw



[Translation done.]

Forming the oxide film (cuprous oxide) in the peripheral face of a sealing electrode, making a sealing electrode attach a glass bead outside, inserting this in the both ends of a glass tube, heating in filler gas atmosphere with a carbon heater, and closing a sealing electrode, a glass bead, and a glass tube simultaneously is performed. Although this sealing electrode is metal, since a cuprous oxide film exists in this peripheral face, it has wettability with the glass which carried out melting softening.

[0004]Drawing 2 (a) - (c) is a sectional view showing the manufacture procedure of this surge suppressor. First, the glass tube 5, the glass bead 9B, and the sealing electrode 6B with the lead 7B are inserted in the enclose part of the lower heater of a carbon heater one by one. And the surge absorbing element 3 which laminated the cap electrodes 8A and 8B with a flange on both ends is inserted into this glass tube 5 (drawing 2 (a)).

[0005]Next, after inserting the glass bead 9A so that the flange of the cap electrode 8A of the surge absorbing element 3 in the glass tube 5 may be contacted, The upper heater of the carbon heater which transferred the sealing electrode 6A with the lead 7A is put (drawing 2 (b)), and it puts into a sealing arrangement, and at 550-750 \*\*, it heats about 1 to 3 minutes, and seals (drawing 2 (c)).

[0006]

[Problem(s) to be Solved by the Invention]In the above-mentioned conventional sealing method, the cuprous oxide film of the surface of a sealing electrode is returned at the time of heating, the wettability to the sealing electrode of glass falls, and there is a possibility of raising a closure defective fraction.

[0007]This invention cancels such a problem and an object of this invention is to provide the sealing method of the surge suppressor which can close the end of a glass tube certainly.

[0008]

[Means for Solving the Problem]In a sealing method of a surge suppressor which performs gas closure of a surge absorbing element in filler gas which heated a sealing method of a surge suppressor of this invention with a carbon heater, Consist of metal or an alloy previously, make a sealing electrode in which a film of cuprous oxide is provided outside, and a glass bead into which a periphery of this sealing electrode was made to fit weld in nonreducible atmosphere, and a sealed body is produced, Subsequently, in filler gas heated with a carbon heater, gas closure of this surge absorbing element is carried out using this sealed

body and a glass tube.

[0009]If it is in a sealing method of this surge suppressor, Since atmosphere at the time of making a peripheral face of a sealing electrode weld glass is made into nonreducible atmosphere, A cuprous oxide film on the metal surface of a sealing electrode does not \*\*\*\*, and when heating and closing in filler gas atmosphere heated with a carbon heater, a glass tube, a glass bead, and a sealing electrode fully get used, and can close certainly.

[0010]This invention can be certainly closed, even if atmosphere at the time of closure is a reducing atmosphere.

[0011]

[Embodiment of the Invention]Hereafter, an embodiment is described with reference to drawings. Drawing 1 is a sectional view showing the sealing method of the surge suppressor concerning an embodiment.

[0012]First, the lead 11 is welded to the sealing electrode 12 as the (a) figure. Next, as shown in the (b) figure, the glass bead 13 (tube-like object of short glass) is attached outside the peripheral face of this sealing electrode 12, it heats in the atmosphere which subsequently is not reduction nature, and as shown in the (c) figure, the sealing electrode 12 is made to weld the glass bead 13, and it is considered as the sealed body 15.

[0013]Subsequently, the sealed body 15 is inserted in the end of the glass tube 14, and, subsequently to in the glass tube 14, a surge absorbing element (graphic display abbreviation) is inserted. This sealed body 15 is inserted in the other end of the glass tube 15 by putting the upper heater of the carbon heater which transferred the sealed body 15 which consists of the sealing electrode 12 with a lead in which the glass bead 13 was welded. After inserting a surge absorbing element into the glass tube 14, inert gas replacement is performed and it is considered as filler gas atmosphere.

[0014]Next, it heats in filler gas atmosphere within this carbon heater, and the glass bead 13 and the glass tube 14 are welded. The surge suppressor 16 by which both ends were certainly closed by this as shown in the (e) figure is produced.

[0015]As for the above-mentioned glass tube 14, what has softening temperature higher than the glass bead 13 is preferred.

[0016]As filler gas, CO<sub>2</sub>, SF<sub>6</sub>, CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, C<sub>3</sub>F<sub>8</sub>, these mixed gas, etc. besides rare gas, such as Ar, helium, Ne, and Xe, can be used.

[0017]As a sealing electrode, the JUMETTO alloy which

formed the cuprous oxide layer in the surface as an oxide film is preferred. A copper coating steel wire etc. are used as a lead.

[0018]

[Example]According to the procedure of drawing 1, the surge suppressor was produced using what consists of a following material and size as example 1 sealing electrode, a lead, a glass bead, and a glass tube.

[0019]

Sealing electrode: JUMETTO by which the cuprous oxide layer was formed in 1.7 mm in diameter, 2.0 mm in thickness, and the construction material:surface Lead: Copper coating steel wire which is 0.5 mm of wire sizes Glass bead: Product made from glass of lead which is the softening temperature of 600 \*\* The outer diameter of 3.1 mm, 1.8 mm in inside diameter, a length 2.0mm glass tube: Product made from glass of lead with a softening temperature of 700 \*\* The outer diameter of 5.1 mm, 3.2 mm in inside diameter, and the welding temperature of the 14-mm glass bead in length were 660 \*\*, and atmosphere at this time was set to Ar.

[0020]The enclosure gas in a glass tube was made into CO<sub>2</sub>, and the cooking temperature and time at the time of closure were set to 720 \*\*x1.0min.

[0021]When helium leak check of an enclosure state was performed about the obtained surge suppressor, it was admitted that the detected amount of helium had very good less than  $1 \times 10^{-9}$  atm-cc/sec and sealed condition.

[0022]The surge suppressor was created like Example 1 except having used the example 2 enclosure gas as argon. When helium leak check of an enclosure state was performed about the obtained surge suppressor, it was admitted that the detected amount of helium had very good less than  $1 \times 10^{-9}$  atm-cc/sec and sealed condition.

[0023]The surge suppressor was created like Example 1 except having made it make a sealing electrode, a glass bead, and a glass tube weld simultaneously, without making a sealing electrode weld comparative example 1 glass bead beforehand. When helium leak check of an enclosure state was performed about the obtained surge suppressor, it was accepted that the detected amount of helium is inferior to  $1 \times 10^{-5}$  atm-cc/sec and the closure characteristic.

[0024]The surge suppressor was produced like the comparative example 1 except having used the comparative example 2 enclosure gas as argon. When helium leak check of an enclosure state was performed about the obtained

surge suppressor, it was admitted that the detected amount of helium had very good less than  $1 \times 10^{-9}$  atm-cc/sec and sealed condition.

[0025] From these Examples 1 and 2 and comparative examples 1 and 2, even when the gas of what kind of description is used as enclosure nature gas according to this invention method, it is admitted that a surge suppressor with the very good closure characteristic can be manufactured.

[0026]

[Effect of the Invention] As above, even when closing with a carbon heater according to this invention method, using the gas of what kind of description as filler gas, a surge suppressor with the very good closure characteristic can be manufactured. According to this invention, a surge suppressor with high firing potential with a large tube diameter of a glass tube is efficiently producible.

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[Translation done.]